

Mr. Douglas J. Walters
Nuclear Energy Institute
1776 I Street, NW
Suite 300
Washington, DC 20585

September 19, 1997

ENT000097
Submitted: March 28, 2012

SUBJECT: DETERMINATION OF AGING MANAGEMENT REVIEW FOR ELECTRICAL COMPONENTS

Dear Mr. Walters:

During the Nuclear Regulatory Commission staff's review of the Nuclear Energy Institute's NEI 95-10, "Industry Guideline for Implementing the Requirements of 10 CFR Part 54 - The License Renewal Rule," the need was identified for guidance on whether selected electrical components are subject to an aging management review. NEI addressed a number of the components in its letter dated December 24, 1996. Consistent with the staff's approach in its February 27, 1997, letter to provide positions on significant issues associated with the license renewal regulatory guide and NEI 95-10, enclosed please find the staff's position on the aging management review requirements for selected electrical components. The recommendations in the enclosed position should be considered when revising NEI 95-10.

Sincerely,

Original signed by:

Christopher I. Grimes, Director
License Renewal Project Directorate
Division of Reactor Program Management
Office of Nuclear Reactor Regulation

Project 690

Enclosure: As stated

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NEI 95-10



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

September 19, 1997

Mr. Douglas J. Walters
Nuclear Energy Institute
1776 I Street, NW
Suite 300
Washington, DC 20585

SUBJECT: DETERMINATION OF AGING MANAGEMENT REVIEW FOR ELECTRICAL COMPONENTS

Dear Mr. Walters:

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Sincerely,

A handwritten signature in cursive script, reading "C. I. Grimes".

Christopher I. Grimes, Director
License Renewal Project Directorate
Division of Reactor Program Management
Office of Nuclear Reactor Regulation

Project 690

Enclosure: As stated

cc: w/encl: See next page

NUCLEAR ENERGY INSTITUTE (NEI)

Project No. 690

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Determination of aging management review for electrical components

Issue:

Determining if transformers, fuses, indicating lights, heat tracing, electric heaters, and recombiners are subject to an aging management review.

NRC staff position:

This issue relates to the guidance provided in the Statements of Consideration (SOC) in which the Commission concluded that an aging management review is required for passive, long-lived structures and components within the scope of the license renewal rule. Appendix B of NEI 95-10 addresses this requirement by identifying typical structure, component, and commodity groupings and a determination as to whether they require an aging management review. Several electrical components, as identified above, were not classified in Appendix B. The rule in §54.21(a)(1), states that "structures and components subject to an aging management review shall encompass those structures and components (i) [t]hat perform an intended function as described in §54.4, without moving parts or without a change in configuration or properties." The SOC uses the term "passive" to represent these characteristics for convenience. The description of "passive" structures and components incorporated into §54.21(a)(1)(i) is used only in conjunction with the IPA review in the license renewal process. The SOC accompanying the renewal rule states: "The Commission has determined that passive structures and components for which aging degradation is not readily monitored are those that perform an intended function without moving parts or a change in configuration or properties." (60 FR 22477). The SOC also states: "[T]he commission has concluded that 'a change in configuration or properties' should be interpreted to include 'a change in state,' which is a term sometimes found in the literature relating to 'passive.'"

§54.21(a)(1)(i) excludes a variety of electrical and instrumentation and control (I&C) structures and components from an aging management review for renewal such as motors, diesel generators, air compressors, pressure transmitters, pressure indicators, water level indicators, switchgear, cooling fans, transistors, batteries, breakers, relays, switches, power inverters, circuit boards, battery chargers, and power supplies. The SOC provides the following discussion as the basis for excluding several electrical and I&C devices from an aging management review: "an electrical relay can change its configuration, and a battery changes its electrolyte properties when discharging" and "a transistor can 'change its state'." The SOC also provides the following discussion as the basis to include electrical cables in an aging management review: "they perform their intended function without moving parts or without a change in configuration or properties and the effects of aging degradation for these components are not readily monitorable." (60 FR 22477)

While §54.21(a)(1)(i) excludes many electrical and I&C components from an aging management review for renewal, it also states that the exclusion is "not limited to" only these components. The staff has considered the aging

Attachment

management review requirements for transformers, fuses, indicating lights, heat tracing, electric heaters, and recombiners with respect to the definitions, background, and specific electrical examples in the license renewal rule (circuit breakers, relays, motors, circuit boards, etc.). Based on the considerable discussion provided in the rule and 30C, the staff compared the electrical components identified above with the examples explicitly provided in the rule in terms of how the performance of their intended functions would be achieved and whether aging degradation of these components would be readily monitored using currently available techniques, in a similar way by which the examples in the rule (circuit breakers, relays, switches, etc.) would be monitored. These techniques include performance or condition monitoring by testing and maintenance/surveillance programs that include instrument checks, functional tests, calibration functional tests, and response time verification tests. The results of these tests and performance monitoring programs can be analyzed and trended to provide an indication of aging degradation for these electrical components as discussed below:

- * Transformers perform their intended function through a change in state by stepping down voltage from higher to a lower value, stepping up voltage to a higher value, or providing isolation to a load. Transformers perform their intended function through a change in state similar to switchgear, power supplies, battery chargers, and power inverters, which have been excluded in §54.21(a)(1)(i) from an aging management review. Any degradation of the transformer's ability to perform its intended function is readily monitorable by a change in the electrical performance of the transformer and the associated circuits. Trending electrical parameters measured during transformer surveillance and maintenance such as Doble test results, and advanced monitoring methods such as infrared thermography, and electrical circuit characterization and diagnosis provide a direct indication of the performance of the transformer. Therefore, transformers are not subject to an aging management review.
- * Indicating lights (dual filament) perform their intended function through a change in state by displaying readily monitorable visible light when energized with sufficient voltage. Indicating lights perform their intended function through a change in state similar to transistors and circuit boards, which have been excluded in §54.21(a)(1)(i) from an aging management review. Any degradation of the indicating lights ability to perform its intended function is readily monitorable since the lights (e.g., control room and local panel annunciators) typically have both a visual and audio test capability that is initiated on a periodic basis by the operator. This self-test capability is relied upon to provide a direct indication of the performance of the indicating lights. Therefore, indicating lights are not subject to an aging management review.
- * Heat tracing performs its intended function through a change in state by supplying heat when energized, for example, to a boric acid system or a

refueling water storage tank/piping in order to maintain a minimum solution temperature to prevent boron from precipitating out or water from freezing in an outside pipe. Heat tracing performs its intended function through a change in state when energized similar to a power supply, battery charger, power inverter, etc., which have been excluded in §54.21(a)(1)(i) from an aging management review. Any degradation of the heat tracing to perform its intended function is readily monitored by alarm circuitry (control room and local panel annunciators) or by surveillance requirements that monitor solution temperature on a periodic basis which provides a direct indication of the performance of the heat tracing. Therefore, heat tracing is not subject to an aging management review.

- * Electric heaters perform their intended function through a change in state by supplying heat when energized, for example, to a pressurizer water volume for reactor coolant system pressure control. Electric heaters perform their intended function through a change in state similar to a battery charger, power inverter, power supply, etc., that change state when energized and which have been excluded in §54.21(a)(1)(i) from an aging management review. Any degradation of the electric heaters' ability to perform their intended function due to aging will be readily monitorable from existing monitoring equipment (voltmeters and active performance of the equipment in the circuit) and surveillance requirements by verifying that the heaters are energized and by measuring circuit current on a periodic basis. Therefore, electric heaters are not subject to an aging management review for the intended function of supplying heat. The pressure boundary intended function would still be subject to an aging management review.

The staff has also considered the aging management review requirements for fuses and hydrogen recombiners as discussed below:

- * Fuses perform one of their two intended functions through a change in configuration or state of the fuse by interrupting power in the case of a fault or overload in a load in order to provide protection to the rest of the electrical circuit. Fuses also perform a second intended function which is to maintain electrical continuity during non-faulted conditions. Unlike other electrical components which have similar continuity functions such as breakers, switches, and relays which have been excluded in § 54.21 (a)(1)(i) from an aging management review, degradation of the fuse's ability to perform this intended function due to aging is not readily monitorable. Degradation of the fuse's intended continuity function may not result in detectable losses in associated system safety functions until degradation becomes unacceptable. Therefore, the staff believes that fuses are subject to an aging management review.
- * Recombiners remove gaseous hydrogen from the containment atmosphere by combining hydrogen with oxygen to form water. This intended function is accomplished with several component types such as electric heater

banks, cabling, connections, etc. As such, recombiners should be considered as complex assemblies and should be evaluated on a plant specific basis to determine if they are subject to an aging management review for renewal.

Based on the above assessment, the staff concluded that these components, with the exception of fuses and recombiners, perform their intended function(s) with a change in configuration/state and the effects of aging are readily monitored and therefore, are not subject to an aging management review. Electrical and I&C structures and components that are subject to an aging management review for renewal include, but may not be limited to: electrical cables and connections, fuses, electrical and I&C penetration assemblies, cable trays, and electrical and I&C cabinets, panels, racks, frames, enclosures, and other similar component supports.

NRC staff recommendations:

The NRC staff recommends revising Appendix B of NEI 95-10 to indicate that transformers, indicating lights, heat tracing, and electric heaters do not require an aging management review (recombiners should remain plant specific) and to state that electrical and I&C structures and components subject to an aging management review for renewal should include: electrical cables and connections, fuses, electrical and I&C penetration assemblies, cable trays, and electrical and I&C cabinets, panels, racks, frames, enclosures, and other similar component supports.